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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,048	08/28/2001	Takeshi Nishi	SEL 274	5731

7590 09/10/2007

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EXAMINER	
YAMNITZKY, MARIE ROSE	
ART UNIT	**PAPER NUMBER**
1774	

MAIL DATE	DELIVERY MODE
09/10/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/941,048	NISHI ET AL.	
	Examiner	Art Unit	
	Marie R. Yamnitzky	1774	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5,6,9,10,15,17,19-22 and 27-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5,6,9,10,15,17,19-22 and 27-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *28 June 2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on June 28, 2007 have been entered.

2. The amendment filed June 28, 2007 cancels claims 7, 8, 11, 12, 16, 18, 23-26 and 31-34, thereby rendering moot the rejection of these claims.

Claims 5, 6, 9, 10, 15, 17, 19-22 and 27-30 are pending.

3. The references cited with the IDS filed June 28, 2007 have been considered by the examiner and are made of record.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5, 6, 15 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien et al. in *Appl. Phys. Lett.* Vol. 74, No. 3, pp. 442-444 or Baldo et al. in *Appl. Phys. Lett.* Vol. 75, No. 1, pp. 4-6, either reference in view of Salbeck et al. in *Synthetic Metals* 91, pp. 209-215, and Grushin et al. (US 2002/0121638 A1).

O'Brien et al. disclose an organic electroluminescent device comprising a hole transport layer and an organic luminescent layer in which the hole transport layer is made of α-NPD and the luminescent layer is made of CBP as a host material and PTOEP as a phosphorescent dopant. The luminescent layer is capable of converting triplet excitation energy into light to be emitted. See the whole O'Brien article.

Baldo et al. disclose an organic electroluminescent device comprising a hole transport layer and an organic luminescent layer in which the hole transport layer is made of α-NPD and the luminescent layer is made of CBP as a host material and $Ir(ppy)_3$ as a phosphorescent dopant. The luminescent layer is capable of converting triplet excitation energy into light to be emitted. See the whole Baldo article.

Neither O'Brien et al. nor Baldo et al. disclose spiro-CBP (the host material required by claim 5 and dependents) or spiro-NPD (the material required for the hole transport layer of claim 5 and dependents).

Salbeck et al. teach that by using a spiro-linkage to modify low molecular organic compounds, processability and morphologic stability can be increased while retaining the electronic properties of the compounds (e.g. see the abstract). Given the teachings of Salbeck et al., it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize spiro-CBP in place of CBP in O'Brien's or Baldo's device, and to utilize spiro-NPD in place of NPD in O'Brien's or Baldo's device, in order to increase the thermal stability of the devices. One of ordinary skill in the art at the time of the invention, having knowledge of the teachings of Salbeck et al., would have reasonably expected spiro-CBP and spiro-NPD to have the same electronic properties as CBP and NPD, respectively, while having better thermal

stability than the non-spiro compounds. Salbeck et al. explicitly teach on page 211 that spiro-CBP (Salbeck's spiro-CARB) has an "extraordinary high melting point". Spiro-NPD is similar in structure to Salbeck's spiro-TAD, which is also disclosed as having improved morphologic stability relative to similar non-spiro compounds. From Salbeck's teachings such as in the first paragraph of the introduction, and from knowledge in the art, one of ordinary skill in the art at the time of the invention would have recognized the value of using compounds of improved thermal stability in the manufacture of organic electroluminescent devices.

Claim 5 and dependents also requiring a hole blocking layer comprising a spiro-triazole compound of specified formula. This spiro-triazole compound is not disclosed by O'Brien et al. or Baldo et al. Instead, O'Brien et al. and Baldo et al. use 2,9-dimethyl,4-7,diphenyl-1,10-phenanthroline ("BCP") for the hole blocking layer (e.g. see the paragraph bridging pages 442 and 443 in the O'Brien article, and see the paragraph bridging pages 4 and 5 in the Baldo article).

Grushin et al. disclose a device comprising an emitting layer comprising an iridium compound that is capable of converting triplet excitation energy into light to be emitted, the device further comprising an electron transporting layer which may be made of "TAZ", which is the triazole component of the spiro-triazole compound required by present claim 5 and dependents. Grushin et al. teach that "TAZ" may be used for the same purpose as 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (Grushin's "DDPA"). "DDPA" as identified by Grushin et al. is the same as O'Brien's or Baldo's "BCP".

It would have been a *prima facie* obvious modification to one of ordinary skill in the art at the time of the invention, having knowledge of Grushin's disclosure that TAZ could be used for the same purpose as BCP, to substitute TAZ for BCP in O'Brien's or Baldo's device.

Further, having knowledge of the teachings of Salbeck et al. regarding the advantages of a spiro-linkage, one of ordinary skill in the art at the time of the invention would have been motivated to utilize spiro-TAZ in order to provide improved thermal stability while retaining the electronic properties of TAZ. Grushin et al. also teach that "PBD" can be used for the same purpose as TAZ or BCP, and Salbeck et al. explicitly teach that spiro-PBD has advantages over PBD. Spiro-TAZ has a spiro-linkage formed between two 4-biphenylyl groups of two TAZ molecules just as Salbeck's spiro-PBD has a spiro-linkage formed between two 4-biphenylyl groups of two PBD molecules. It is the examiner's position that it would have been within the level of ordinary skill of a worker in the art at the time of the invention to apply Salbeck's spiro-concept to various low molecular organic compounds that were known in the art at the time of the invention in order to provide the advantages of spiro-linkage as taught by Salbeck. One of ordinary skill in the art at the time of the invention would have reasonably expected that providing a compound having two TAZ molecules that a spiro-linked similar to Salbeck's compound having two PBD molecules that are spiro-linked would have similar advantages.

Regarding claim 15, the combination of references with O'Brien et al. as the primary reference renders the claim unpatentable wherein the metal complex is PtOEP since O'Brien et al. disclose this metal complex as a phosphorescent dopant, and the combination of references with Baldo et al. as the primary reference render the claim unpatentable wherein the metal complex is Ir(ppy)3 since Baldo et al. disclose this metal complex as a phosphorescent dopant.

The device of claim 21 is required to further comprise an electron transporting layer over the hole blocking layer. O'Brien et al. disclose a device having an electron transporting layer

between a hole blocking layer and a cathode. Baldo et al. disclose a device having an electron transporting layer between a hole blocking layer and a cathode.

6. Claims 19, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien et al. in *Appl. Phys. Lett.* Vol. 74, No. 3, pp. 442-444 or Baldo et al. in *Appl. Phys. Lett.* Vol. 75, No. 1, pp. 4-6, either reference in view of Salbeck et al. in *Synthetic Metals* 91, pp. 209-215, and Grushin et al. (US 2002/0121638 A1), as applied to claims 5, 6, 15 and 21 above, and further in view of Böhler et al. (US 6,262,441 B1).

The limitations recited in claims 19, 20 and 22 pertain to structural features known in the art at the time of the invention to be useful in the construction of light emitting displays. For example, Böhler et al. disclose OLED displays that are active light emitting devices and teach that polarization filters may be included in the display structure, and thin film transistors may be used to drive the individual pixels of the display. For example, see column 3, lines 32-41 of the Böhler patent. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate structural features known in the art at the time of the invention.

7. Claims 9, 10, 17 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien et al. in *Appl. Phys. Lett.* Vol. 74, No. 3, pp. 442-444 or Baldo et al. in *Appl. Phys. Lett.* Vol. 75, No. 1, pp. 4-6, either reference in view of Salbeck et al. in *Synthetic Metals* 91, pp. 209-215, Grushin et al. (US 2002/0121638 A1) and Kreuder et al. (US 6,329,082 B1).

O'Brien et al. disclose an organic electroluminescent device comprising a hole transport layer and an organic luminescent layer in which the hole transport layer is made of α-NPD and the luminescent layer is made of CBP as a host material and PTOEP as a phosphorescent dopant. The luminescent layer is capable of converting triplet excitation energy into light to be emitted. See the whole O'Brien article.

Baldo et al. disclose an organic electroluminescent device comprising a hole transport layer and an organic luminescent layer in which the hole transport layer is made of α-NPD and the luminescent layer is made of CBP as a host material and $Ir(ppy)_3$ as a phosphorescent dopant. The luminescent layer is capable of converting triplet excitation energy into light to be emitted. See the whole Baldo article.

Neither O'Brien et al. nor Baldo et al. disclose spiro-CBP (the host material required by claim 9 and dependents) or spiro-NPD (the material required for the hole transport layer of claim 9 and dependents).

Salbeck et al. teach that by using a spiro-linkage to modify low molecular organic compounds, processability and morphologic stability can be increased while retaining the electronic properties of the compounds (e.g. see the abstract). Given the teachings of Salbeck et al., it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize spiro-CBP in place of CBP in O'Brien's or Baldo's device, and to utilize spiro-NPD in place of NPD in O'Brien's or Baldo's device, in order to increase the thermal stability of the devices. One of ordinary skill in the art at the time of the invention, having knowledge of the teachings of Salbeck et al., would have reasonably expected spiro-CBP and spiro-NPD to have

the same electronic properties as CBP and NPD, respectively, while having better thermal stability than the non-spiro compounds. Salbeck et al. explicitly teach on page 211 that spiro-CBP (Salbeck's spiro-CARB) has an "extraordinary high melting point". Spiro-NPD is similar in structure to Salbeck's spiro-TAD, which is also disclosed as having improved morphologic stability relative to similar non-spiro compounds. From Salbeck's teachings such as in the first paragraph of the introduction, and from knowledge in the art, one of ordinary skill in the art at the time of the invention would have recognized the value of using compounds of improved thermal stability in the manufacture of organic electroluminescent devices.

Claim 9 and dependents also requiring a hole blocking layer comprising a spiro-triazole compound of specified formula wherein the spiro linkage is a hetero-spiro linkage containing silicon. This spiro-triazole compound is not disclosed by O'Brien et al. or Baldo et al. Instead, O'Brien et al. and Baldo et al. use 2,9-dimethyl,4-7,diphenyl-1,10-phenanthroline ("BCP") for the hole blocking layer (e.g. see the paragraph bridging pages 442 and 443 in the O'Brien article, and see the paragraph bridging pages 4 and 5 in the Baldo article).

Grushin et al. disclose a device comprising an emitting layer comprising an iridium compound that is capable of converting triplet excitation energy into light to be emitted, the device further comprising an electron transporting layer which may be made of "TAZ", which is the triazole component of the spiro-triazole compound required by present claim 9 and dependents. Grushin et al. teach that "TAZ" may be used for the same purpose as 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (Grushin's "DDPA"). "DDPA" as identified by Grushin et al. is the same as O'Brien's or Baldo's "BCP".

Kreuder et al. teach the use of hetero-spiro compounds in electroluminescent devices. The spiro linkage may have silicon as the heteroatom of the linkage. Kreuder et al. teach that compounds having a hetero-spiro linkage have a significantly reduced tendency to crystallize. For example, see column 1, line 58-c. 4, l. 49, c. 5, l. 41-c. 6, l. 35, and c. 11, l. 51-c. 12, l. 5.

It would have been a *prima facie* obvious modification to one of ordinary skill in the art at the time of the invention, having knowledge of Grushin's disclosure that TAZ could be used for the same purpose as BCP, to substitute TAZ for BCP in O'Brien's or Baldo's device. Grushin et al. also teach that "PBD" can be used for the same purpose as TAZ or BCP, and Salbeck et al. explicitly teach that spiro-PBD has advantages over PBD. Spiro-TAZ has a spiro-linkage formed between two 4-biphenylyl groups of two TAZ molecules just as Salbeck's spiro-PBD has a spiro-linkage formed between two 4-biphenylyl groups of two PBD molecules. It is the examiner's position that it would have been within the level of ordinary skill of a worker in the art at the time of the invention to apply Salbeck's spiro-concept to various low molecular organic compounds that were known in the art at the time of the invention in order to provide the advantages of spiro-linkage as taught by Salbeck. One of ordinary skill in the art at the time of the invention would have reasonably expected that providing a compound having two TAZ molecules that are spiro-linked similar to Salbeck's compound having two PBD molecules that are spiro-linked would have similar advantages. Further, having knowledge of the teachings of Salbeck et al. and Kreuder et al. regarding the advantages of a spiro-linkage, one of ordinary skill in the art at the time of the invention would have been motivated to utilize spiro-TAZ in order to provide improved thermal stability while retaining the electronic properties of TAZ, and would

have reasonably expected a hetero-spiro linkage containing silicon to provide similar advantages to a hydrocarbon spiro linkage.

Regarding claim 17, the combination of references with O'Brien et al. as the primary reference renders the claim unpatentable wherein the metal complex is PtOEP since O'Brien et al. disclose this metal complex as a phosphorescent dopant, and the combination of references with Baldo et al. as the primary reference render the claim unpatentable wherein the metal complex is Ir(ppy)3 since Baldo et al. disclose this metal complex as a phosphorescent dopant.

The device of claim 29 is required to further comprise an electron transporting layer over the hole blocking layer. O'Brien et al. disclose a device having an electron transporting layer between a hole blocking layer and a cathode. Baldo et al. disclose a device having an electron transporting layer between a hole blocking layer and a cathode.

8. Claims 27, 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien et al. in *Appl. Phys. Lett.* Vol. 74, No. 3, pp. 442-444 or Baldo et al. in *Appl. Phys. Lett.* Vol. 75, No. 1, pp. 4-6, either reference in view of Salbeck et al. in *Synthetic Metals* 91, pp. 209-215, Grushin et al. (US 2002/0121638 A1) and Kreuder et al. (US 6,329,082 B1), as applied to claims 9, 10, 17 and 29 above, and further in view of Böhler et al. (US 6,262,441 B1).

The limitations recited in present claims 27, 28 and 30 pertain to structural features known in the art at the time of the invention to be useful in the construction of light emitting displays. For example, Böhler et al. disclose OLED displays that are active light emitting devices and teach that polarization filters may be included in the display structure, and thin film transistors may be used to drive the individual pixels of the display. For example, see column 3,

lines 32-41 of the Böhler patent. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate structural features known in the art at the time of the invention.

9. Applicant's arguments filed June 28, 2007 have been fully considered but they are not persuasive.

The previously applied rejections have been rewritten in this Office action to delete references to claims which have been cancelled, and to point to teachings in the prior art considered by the examiner to be particularly relevant to applicant's arguments.

Applicant argues that the combination of spiro-NPD(NPB), spiro-CBP and spiro-TAZ provides superior durability for triplet emitting, and is a non-obvious combination that overcomes problems described on pages 7-8 of the specification. Applicant argues that while Salbeck discloses the spiro-concept for improving processability and morphologic stability and discloses spiro-CBP, Salbeck does not disclose spiro-NPD(NPB) or spiro-TAZ. Applicant argues that it is not proper to combine the spiro-concept of Salbeck to NPD(NPB) or TAZ without showing the existence of these spiro compounds.

Applicant further argues that it would not have been obvious to one skilled in the art at the time of the present invention to use spiro compounds because at the time of the present invention, people did not believe that there was a problem with a light emitting layer including CBP and $Ir(ppy)_3$ or PtOEP, since it was thought that these combinations were enough for light-emitting. Applicant further argues that spiro compounds could be expensive and synthesis of spiro compounds could be complicated.

Applicant's arguments are not persuasive. Spiro-NPD(NPB) is similar in structure to Salbeck's spiro-TAD. Spiro-TAZ has a spiro-linkage formed between two 4-biphenylyl groups of two TAZ molecules just as Salbeck's spiro-PBD has a spiro-linkage formed between two 4-biphenylyl groups of two PBD molecules. It is the examiner's position that it would have been within the level of ordinary skill of a worker in the art at the time of the invention to apply Salbeck's spiro-concept to various low molecular organic compounds that were known in the art at the time of the invention in order to provide the advantages of spiro-linkage as taught by Salbeck.

Further, while combinations of CBP and $Ir(ppy)_3$, and CBP and PtOEP, were known in the art at the time of the invention to be capable of emitting light when utilized in an organic EL device structure, inferior device performance characteristics associated with compounds having lower morphologic stability were also generally known in the art at the time of the invention. One of ordinary skill in the art at the time of the invention would not be dissuaded by factors such as expense or ease (or lack thereof) of synthesis where the resultant spiro compounds would be expected to have superior properties and provide advantages in the desired final product.

10. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY
August 31, 2007

Marie R. Yamnitzky

MARIE YAMNITZKY
PRIMARY EXAMINER

1774